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solution growth is not entirely inhibited. The non-toxicity of sulphocyanates has also been observed by FERNBACH and in extremely dilute solutions by SAUTON.[30]

In a short note KOSSOWICZ and LOEW[31] report the availability of sodium thiosulphate as a nutrient for a number of yeasts and fungi. Hydrogen sulphide, free sulphur, and sulphuric acid are among the products resulting from the action of different organisms on the compound.—H. HASSELBRING.

The leaf-bud of Cordaites.—LIGNIER[32] has made an intimate study of the developing leaves of *Cordaites* from a portion of a silicified bud from the Stephanian of Grand' Croix (Loire). His piece of material was about 3 cm. long and in the matrix immediately around the bud proper and concentric with it had adult leaves identical in structure with *C. lingulatus* of RENAULT. He thinks it reasonable to suppose that these were borne on the same branch which bore the bud itself, especially since he found these leaves identical in structure with the outermost ones of the bud, with the exception of such differences as might be due to age. His conclusion that the bud is that of *C. lingulatus* seems beyond reasonable doubt.

In the young leaves the primordial strands are very small, the bast appearing to develop first as in living forms. In the older leaves the bast is almost always completely destroyed, so that practically nothing was seen of the secondary bast. The protoxylem and centripetal metaxylem develop early, with elements of typical form, ring, spiral, scalariform, and reticulate. The centrifugal wood comes later, appearing first in the region of the protoxylem. About the same time appear certain cells which LIGNIER designates "cellules diaphragmatiques," situated between the bundle sheath and either the body of the centripetal or the sides of the arc of centrifugal xylem. The region occupied by it may be quite extensive. LIGNIER has not compared the bundle with that of cycads, but similar cells do occur in the same region in the cycad bundle, especially lateral to the base of the centripetal xylem.

The sheath consists of several layers of large cells which differentiate early. The cells begin to thicken their walls when the xylem consists of only one or two tracheids. They are most abundant ordinarily at the sides of the bundle, and show certain resemblances to the xylem tissue, to which LIGNIER refers. Most, if not all, of their transverse walls are covered with "punctuations aréolées" and "serées," which are larger, however, and more irregular than those of the tracheary elements. Those on the longitudinal walls are even more irregular. The character of these cells is also very similar to that in the cycads, where the sheath cells right and left of the centripetal xylem are similarly pitted. It is very different from that described by Dr. STOPES for *C. principalis.* She states that the sheath of this form is composed of two parts, an inner of long and slender elements and an outer of short and large ones, both with bordered pits.[33] Recently Miss BENSON[34] has described a form (*C. Felicis*), from the Lower Coal measures of England, with a much less definitely differentiated inner sheath. LIGNIER considers that the "bois diaphragmatique" which he has described corresponds to this "inner sheath" in both these forms. If this conclusion is correct, and there seems little doubt that it is, then his form and that of Miss BENSON have less specialized and more cycadean sheaths than that of *C. principalis.* The bundles of these two forms would thus stand nearer to the *Poroxylon* type, of the detailed structure of which SCOTT in his *Studies in fossil botany* (p. 508) says it is "in fact, that of a cycad." It is interesting to note, in passing, that JEFFREY has chosen the specialized *principalis* type for comparison with *Prepinus* and the Abietineae, while the other is in substantial agreement with the araucarian leaf bundle.

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[30] Rev. BOT. GAZ. **55**:86. 1913.

[31] KOSSOWICZ, A., und LOEW, W., Vorläufige Mitteilung über das Verhalten von Hefen und Schimmelpilzen zu Natriumthiosulfat. Zeitschr. Gärungsphysiol. **2**:78. 1913.

[32] LIGNIER, O., Différenciation des tissus dans le bourgeon végétatif du *Cordaites lingulatus* B. Ren. Ann. Sci. Nat. Bot. IX. **17**:233–254. 1913.

LIGNIER describes at some length the differentiation of certain glandular cells within the bundle sheath. The scelerenchymatous strands above and below the bundle differentiate early, and the mesophyll as well. The cells of the latter have an abundant "protoplasme chlorophyllien probablement accompagné d'hydrates de carbone." The palisade consists ultimately of two or three layers of cells. The epidermis was very poorly preserved and afforded no new data. The bundles were seen to dichotomize, as in ordinary cordaitean leaves, though LIGNIER says that the division does not occur in the same way as STOPES has described in the case of *C. principalis.*

The type of leaf LIGNIER has described is very similar to that of the living broad-leaved forms of the Araucarineae.—R. B. THOMSON.

Water requirement of plants.—BRIGGS and SHANTZ[35] have conducted a series of experiments upon the water requirements of certain crop plants and obtained results which are important not only in determining the most economical plants to cultivate in semi-arid regions, but also in indicating a profitable line of purely ecological research with the natural vegetation of various habitats. The term "water requirement" indicates the ratio of the weight of water absorbed by a plant during its growth to the dry matter produced. The exhaustive review of the literature of the subject will be of great service to all interested in this and allied problems, and demonstrates the fact that while a considerable number of experiments have been performed by a number of

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[33] New Phytol. **2**: *pl. 9. fig. 6.* 1903.

[34] Ann. Botany **26**:201–207. 1912.

[35] BRIGGS, L. J., and SHANTZ, H. L., The water requirements of plants. I. Investigations in the great plains in 1910 and 1911. II. A review of the literature. U.S. Dept. Agric., Bur. Plant Ind. Bulls. 284 and 285. pp. 49 and 96. 1913.